

WHAT IS CLAIMED IS:

1. An injection molding hot runner nozzle comprising:  
a nozzle having a nozzle body with a melt channel extending from a head portion to a tip portion thereof;  
at least one electric heater, said at least one electric heater wrapped around said nozzle body from the head portion to the tip portion thereof to provide heat to said melt channel; and  
at least one temperature sensor, said at least one temperature sensor wrapped around said nozzle body from the head portion to the tip portion thereof to sense a temperature of said melt channel.
2. The injection molding hot runner nozzle according to claim 1, wherein said at least one temperature sensor is a thermocouple.
3. The injection molding hot runner nozzle according to claim 1, wherein said at least one electric heater and said at least one temperature sensor are wrapped around substantially the same portion of said nozzle body.
4. The injection molding hot runner nozzle according to claim 1, wherein said at least one electric heater is radially displaced from said at least one temperature sensor.
5. The injection molding hot runner nozzle according to claim 1, wherein said at least one electric heater and said at least one temperature sensor are separated by a dielectric material with good heat conductance.
6. An injection molding system comprising:  
an injection manifold having at least one manifold melt channel;

at least one injection molding nozzle having a nozzle body with a nozzle melt channel in fluid communication with said at least one manifold melt channel;

at least one heater wire element spirally wound around substantially the length of said nozzle body from a head portion to a tip portion thereof; and

at least one thermocouple wire element spirally wound around substantially the length of said nozzle body from the head portion to the tip portion thereof.

7. The injection molding system according to claim 6, wherein said at least one heater wire element and said at least one thermocouple wire element are spirally wound directly onto an outer surface of said nozzle body.

8. The injection molding hot runner nozzle according to claim 6, wherein said at least one heater wire element is radially displaced from said at least one thermocouple wire element.

9. The injection molding system according to claim 6, wherein said at least one heater wire element and said at least one thermocouple wire element are separated by a heat conductive material.

10. A method of heating a hot runner nozzle comprising the steps of:

providing a hot runner nozzle having a nozzle body with a melt channel extending from a head portion to a tip portion thereof;

spirally winding at least one electrical heater around the nozzle body from the head portion to the tip portion thereof; and

spirally winding at least one thermocouple around the nozzle body from the head portion to the tip portion thereof, whereby the at least one

electrical heater and the at least one thermocouple act upon the same portion of the nozzle body.

11. The method according to claim 10, further comprising the step of:

providing at least one dielectric layer between the at least one electrical heater and an outer surface of the nozzle body.

12. The method according to claim 10, whereby the at least one electrical heater and the at least one thermocouple are radially displaced one from the other with respect to the melt channel of the nozzle body.

13. The method according to claim 10 further comprising the step of:

providing at least one dielectric layer between the at least one electrical heater and the at least one thermocouple.

14. A method of manufacturing a hot runner nozzle comprising the steps of:

forming a hot runner nozzle body with a melt channel extending between a head portion and a tip portion of the nozzle body;

providing at least one independent nozzle heater and at least one thermocouple wire element;

spirally winding the at least one independent nozzle heater around the nozzle body from substantially the head portion to the tip portion thereof; and

spirally winding the at least one thermocouple wire element around the nozzle body from substantially the head portion to the tip portion thereof, such that the at least one independent heater and the at least one thermocouple wire element are positioned substantially along the entire length of the melt channel.

15. The method according to claim 14, wherein successive windings of the at least one independent nozzle heater are closer together in the head and tip portions of said nozzle body and are spaced apart over a central portion of said nozzle body.

16. An injection molding apparatus:

a hot runner nozzle having a nozzle body and a melt channel extending from a head portion to a tip portion;

an electrical heater wire element wrapped around said melt channel from the head portion to the tip portion; and

at least one thermocouple wire element wrapped around said melt channel from the head portion to the tip portion, whereby the electrical heater wire element and the at least one thermocouple wire element are each sandwiched in a dielectrical material.